

Example CS-137 Peaking Procedure

by Beth Hall and Rollie Cantu

The following peaking procedure is used in-house at Ludlum Measurements, Inc. for peaking LMI Models 44-10, 44-11, 44-20, 203, and 243 detectors on the 662-keV Cs-137 peak with a Model 2200 Scaler/Ratemeter. Other scintillation detectors are peaked in the same manner, but have different values for resolution.

The subject detectors utilize a NaI(Tl) crystal scintillator that is 2 inches thick, and the parameters given herein apply to any 2-inch thick crystal scintillator that is peaked under factory conditions. Please note that actual field conditions may necessitate the use of different parameters (such as a wider window). Accordingly, this procedure is offered as an example or guideline only.

1. Switch the M2200 WINDOW to the "ON" position. Set the window at 0.40.

2. Set the threshold dial at 6.42.

3. Peak the detector for Cs-137 (662 keV) as follows:
a. Set the high voltage (HV) dial at 1.50. This ensures that you begin the peak routine below the actual peak.

b. Set the 3-position switch (RATE, HV, BAT) to RATE.

c. Set the range multiplier to X1.

d. Begin increasing the high voltage by slowly rotating the HV dial clockwise. Rotating the dial too

quickly can easily cause the peak to be missed.

e. When the meter deflection is at full scale, switch the range multiplier to X10. Press the RESET button and continue to increase the HV until full-scale deflection is again achieved. Switch the range multiplier to X100, press RESET and continue to increase the HV. (NOTE: Range multiplier settings are suggestions. Actual settings will vary with source size.)

f. When you have located the peak, an increase or a decrease in voltage should drop the count rate. If it does not, check steps 1 and 2 to ensure proper switch settings and repeat the entire process. If the count rate drops with an increase or a decrease in HV, proceed to step 4.

4. To confirm the probe is peaked for the 662-keV peak, set the window at 1.0 and the

5. Once you have confirmed the peak, switch the window "ON," re-adjust the threshold dial to 6.42 and the window to 0.40. Take a 6-second count (1/10 minute). Record the count rate and the peak HV.

6. Rotate threshold dial counterclockwise below 6.42 until the count rate is approximately half of the peak count rate determined in step 5. Record the threshold dial setting.

7. Rotate the threshold dial clockwise above 6.42 until the count rate is once again approximately half of the peak count rate determined in step 5. Record the threshold dial setting.

8. Using the example formula below, determine the full-width-at-half-maximum (FWHM), or resolution, of the peaked probe.

SETTINGS

Threshold dial setting @ 6.82 = 5,000 CPM	Upper - Lower
Threshold dial setting @ 6.42 = 10,000 CPM	$\frac{6.82 - 6.02}{6.62} \times 100 = 12.08\%$
Threshold dial setting @ 6.02 = 5,000 CPM	

Energy peak: Threshold dial setting at peak (6.42) plus 1/2 window dial setting (0.20) = 6.62 x 100 keV/turn = 662 keV.

threshold at 6.12. Record the count rate, then switch the window "OFF." Count rate should stay approximately the same if the probe is peaked. If it is not peaked, the count rate will change dramatically.

9. NOTE: The following criteria apply to the referenced detectors - that is, those with 2-inch thick NaI(Tl) crystal scintillators - for which resolution is an important

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Model 52-1

Portal Monitor

The Model 52-1 is a highly sensitive portal monitor that can be stored in a case until needed. Taking only 5 minutes to set up, the unit automatically determines the ambient radiation background and sets the alarm point. The four beta-gamma sensitive detectors quickly scan personnel as they walk through the portal.

DETECTORS 4 ea. 168 in³ plastic scintillation detectors allowing a total detection area of 672 in³.

SENSITIVITY This instrument will detect the beta-gamma emissions from a 1 μ Ci ¹³⁷Cs carried through the portal at normal walking speed. (per the suggested standard in FEMA report "Contamination Monitoring Standard for a Portal Monitor Used for Emergency Response". Sept 1992). The sensitivity is increased even further in the stop-and-count mode.

PULSE THRESHOLD 4 \pm 1 mV

DISPLAY 2 line X 20 character LCD shows background rates from all detectors, and sigma values above background.

ALARM Indicated by red LED and audible signal (greater than 60 dB at 2 feet)

COUNT TIME Adjustable from 0 - 20 seconds (0 seconds setting is for walk through mode)

ENTER/CHECKING (green LED) Indicates system is ready for use. Flashing LED indicates a count is in progress.

INCOMPLETE/UPDATING (amber LED) Indicates the user has stepped out of portal before counting was completed, or that an update is in progress.

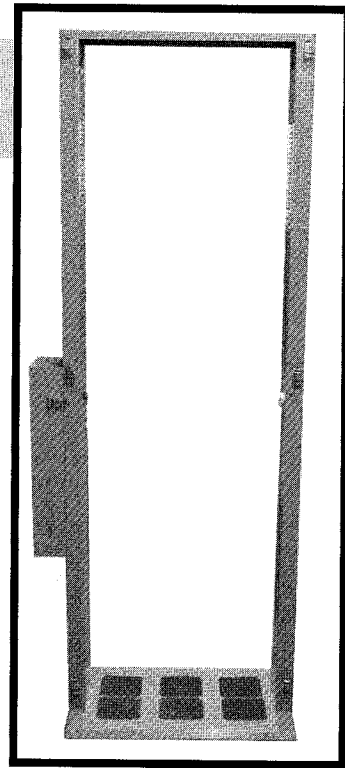
FAILURE (red LED) Indicates a high or low background

INFRARED SENSOR A retro-reflective sensor senses portal occupancy.

PARAMETERS All parameters are stored in non-volatile memory

OUTPUT RS-232 and relay output connectors located on the bottom of the electronics chassis

POWER 85 - 250 VAC, or 2 ea. "D" cell batteries.



BATTERY LIFE Typically 12 hours in a non-alarm condition

CONSTRUCTION Aluminum housing with beige polyurethane enamel paint.

TEMPERATURE RANGE 5°F (-15°C) to 122°F (50°C)

SIZE 83" (211 cm)H X 28" (71 cm)W X 18" (46 cm)D

PORTAL DIMENSIONS 81"(206 cm)T X 24"(61 cm)W

WEIGHT 70 lbs (32 kg)

SHIPPING WEIGHT 100 lbs (45 kg) in case

AVAILABLE OPTIONS
Printer, vehicle scanning option

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CS-137 PEAKING PROCEDURES

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factor): The value of the FWHM should be less than 13% to be considered an acceptable probe. The value of a new probe should be approximately 8 - 10%. Any probe with a FWHM value greater than 13% should be considered marginal and sent in for service.

10. A plateau is usually performed after the successful completion of the FWHM test to establish the operating curve of the phototube. NOTE: The plateau HV should be higher than the peak voltage if the peaking procedure was performed correctly.

Stay tuned for the next edition of "From the Trenches," where we will address peaking with isotopes other than Cs-137.

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